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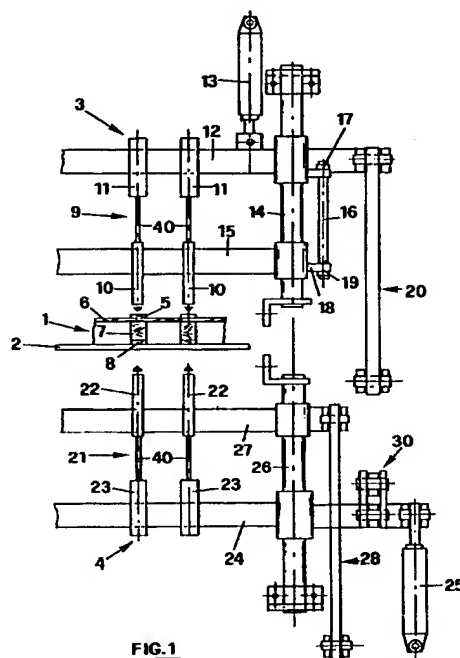
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(54) **A multiple riveting machine, in particular for pallet assembly.**

(57) The invention relates to a multiple riveting machine, in particular for pallet assembly. It comprises a conveyor (2) equipped with straight and discontinuous advancement movement according to predetermined operative phases, which conveyor (2) transports components (5,6,7,8) of the pallets (1) assembled but not fixed, towards the riveting area. In this area is an upper riveting group (3) and a lower riveting group (4) respectively to insert rivets (35) in the superior and inferior components of the transiting pallets (1). The said upper riveting group (3) and lower riveting group (4) operate simultaneously according to predetermined operative phases.



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The invention relates to a multiple riveting machine, in particular for pallet assembly.

As is well known, the structure of pallets is formed by an assembly of wooden components fixed together by means of rivets. This structure comprises three lower planks on which parallelepiped blocks are positioned, on which cross-pieces (or uprights) are positioned to support the upper planks, arranged parallel to the lower planks, being equal or greater in number to the said lower planks.

At present, in accordance with the prior art, in traditional machines the assembled but not yet riveted pallet is located on a conveyor equipped with straight and discontinuous advancement movement in the direction of a riveting area where the conveyor, intercepting an end-run switch, stops. The riveting group descends from above. The rivets are inserted in the upper planks of the pallet, penetrating inside the cross-piece and partially into the blocks.

Once this first riveting has been performed, the pallet advances by one step and is thus subjected to the second riveting operation at the second cross-piece and the second block series. Thus the pallet advances one further step and the third riveting operation is performed.

According to this prior-art procedure, in order to fix the lower planks to the blocks, it is necessary to tilt the pallet (manually or by means of mechanisms) in order to introduce it into a further machine, similar to the preceding one, where a further riveting group descends from above and proceeds to fix, in three phases, the lower planks to the blocks. This fixing can be done manually by an operator equipped with a pneumatic stapler.

The said prior-art machines have a double drawback. Above all two machines are necessary, arranged in series for the fixing of the upper and lower planks, with a consequent-considerable mass that implicates the need to have quite long sheds available, double maintenance costs, higher plant costs and so on. Secondly, a pallet tilting mechanism is required, or personnel who proceed to the task of tilting the pallet manually. This leads to a considerable time loss which has a negative effect on the productivity of the machine.

An essential aim of the present invention is thus that of obviating the above-mentioned drawbacks, relative to machines in the prior art, by providing a riveting machine with which it is possible to fix contemporaneously both the upper and lower components, thus reducing the dimensions of the machine while at the same time increasing its productivity.

These and other aims besides are all reached by the machine object of the present invention, which comprises a conveyor equipped with straight and discontinuous advancement movement according to predetermined operative phases, which transports the components of pallets which are assembled but

not fixed together, towards the riveting area, characterised in that in the said riveting area an upper riveting group and a lower riveting group are located, respectively aimed at inserting rivets in the upper and lower components of the conveyed pallets, the said upper and lower groups operating simultaneously according to the said predetermined operative phases.

Further characteristics and advantages of the present invention will better emerge from the detailed description that follows, of an embodiment of the invention, herein illustrated purely in the form of a non-limiting example in the accompanying figures, in which:

- figure 1 shows, in a schematic frontal view, half of the riveting area of the machine;
- figure 2 shows the same riveting area in a schematic lateral view;
- figure 3 shows schematically a lower riveting head which is part of a lower riveting group.

With reference to the drawings, 1 denotes an assembled pallet with its various components, which however have not yet been fixed among themselves, and 2 denotes a conveyor equipped with straight (according to the direction of the arrow in figure 2) and discontinuous advancement movement according to predetermined operative phases, which conveyor transports the pallet 1 towards the riveting area.

Situated in the said riveting area are an upper riveting group 3 and a lower riveting group 4, respectively destined to insert fixing rivets in the upper components (upper planks 5, cross-pieces 6 and blocks 7) and lower components (lower planks 8 and blocks 7) of the conveyed pallet 1, simultaneously according to predetermined operative phases.

The upper riveting group 3 comprises a series of first riveting organs 9 transversally aligned with respect to the advancement movement of the conveyor 2. Each first riveting organ 9 comprises an upper riveting head 10 which will rest on the upper part of the pallet 1 and will insert a rivet there (or two rivets), and a first pushing organ 11 which will push the rivet (or rivets) into the upper riveting head 10.

The pushing organs 11 are solid to a first horizontal bar 12 on which a double-acting jack 13 acts.

The first horizontal bar 12 is able to slide vertically along two vertical columns 14 (in the drawings only one of the said two columns 14 has been represented) arranged at the sides of the conveyor 2. A second horizontal bar 15 slides along the said vertical columns 14, which second horizontal bar 15 bears the upper riveting head 10. Between the first horizontal bar 12 and the second horizontal bar 15 a connection means is envisaged, constituted by a vertical rod 16 superiorly fixed at 17 to the first horizontal bar 12 and inferiorly slidably inserted in an extension 18 fixed to the second bar 15.

The vertical rod 16 is inferiorly equipped with an enlargement 19 (for example a threaded nut) which

permits, by action on the extension 18, of lifting the second bar 15 on the action of the double-acting jack 13 or of sliding inside the extension 18, permitting the reciprocal nearing and distancing of the two bars 12 and 15.

A lever kinematism 20, present on the two sides of the machine (only one is represented in the drawings) permits of obtaining a uniform movement of the horizontal bar 12 along all of the machine. The lower riveting group 4 comprises a series of second riveting organs 21 transversally aligned with respect to the advancement movement of the conveyor 2.

Each second riveting organ 21 comprises a lower riveting head 22 destined to rest on the inferior part of the pallet 1 and to insert a rivet (or two rivets) and a second pushing organ 23 to push the rivet (or rivets) into the lower riveting head 22.

The second pushing organs 23 are solid to a third horizontal bar 24 on which a double-acting jack 25 operates.

The third horizontal bar 24 is able to slide vertically along two vertical columns 26 (in the drawings only one of the two columns 26 is represented) arranged at the sides of the conveyor 2.

A fourth horizontal bar 27 bearing the lower riveting heads 22 slides along the same two vertical columns 26.

The fourth horizontal bar 27 is activated by means of a leverage 28 by a double-acting jack 29.

A kinematism 30, present on the two sides of the machine (in the drawings only one is shown) permits of obtaining a uniform movement of the third horizontal bar 24 along all of the machine. With reference to figure 3, the lower riveting head 22 is constituted by a body 31 exhibiting at its top mobile jaws 32 and exhibiting internally a straight vertical through-hole 33, opening at the mobile jaws 32, to which through-hole 33 is connected an inclined hole 34.

The rivets 35 travel singly in the inclined hole 34 under the power of compressed air. The rivets 35 are positioned with their points at the end of a stop rod 36 which is perpendicularly mobile with respect to the through-hole 33, and with their heads blocked by a shaped element 37 eccentrically hinged at 38 and associated to a contrast spring 39.

The contrast spring 39 is compressed during the travel of the rivet 35 by action of the said rivet 35 on the shaped element 37.

The straight through-hole 33 receives a press-rod 40 (visible in figures 1 and 2) associated to the second pushing organ 23, which press-rod 40 is axially mobile internally to the through-hole 33 and which pushes the rivet 35 out of the body 31 through the mobile jaws 32. The said mobile jaws 32 have the function of maintaining the rivet 35 position central when it is pressed into the wood of the pallet 1.

It should be noted that the body 31 of the lower riveting head 22 can be opened by rotating the part

represented on the right in figure 3 (the part represented by a broken line) about the hinge 41, after having disengaged the blocking organ 42. It should also be noted that the upper riveting heads 10 do not exhibit the shaped element 37, the contrast spring 39 and the stop rod 36 since the rivet 35 stays in the correct position by force of gravity with its point resting on the mobile jaws 32.

From the above-described, the functioning of the machine object of the invention will be evident.

The pallet 1, with its components assembled but not yet fixed together, reaches, by means of the conveyor 2, the riveting area where it stops in the predetermined position (intercepting an end-run switch which is not illustrated in the drawings).

The lower riveting heads 22 rise on the activation of the double-acting jack 29 (through the leverage 28) and rest on the lower planks 8 of the pallet 1.

Contemporaneously, the upper riveting heads 10 descend from above by action of the double-acting jack 13 (which acts on the horizontal bar 12 which keeps the second horizontal bar 15 raised by means of the vertical rod 16 before descending) and they rest on the upper planks 5 of the pallet 1.

Immediately after, and contemporaneously, the second pushing organs 23 rise (by action of the double-acting jack 25) and the first pushing organs 11 descend (by action of the double-acting jack 13). In this way, the press-rods 40 push the rivets 35 into the wood of the pallet 1.

Thus there occurs a simultaneous riveting of the upper part and the lower part of the pallet 1, and the invention attains its aims.

## Claims

1. A multiple riveting machine, in particular for pallet assembly, comprising a conveyor (2) equipped with straight and discontinuous advancement movement according to predetermined operative phases, which conveyor (2) transports components (5,6,7,8) of pallets (1) which are assembled but not fixed together, towards a riveting area, characterised in that in the said riveting area an upper riveting group (3) and a lower riveting group (4) are located, respectively aimed at inserting rivets (35) in upper and lower components of the conveyed pallets (1), the said upper and lower groups (3, 4) operating simultaneously according to the said predetermined operative phases.
2. A machine as in claim 1, characterised in that the said upper riveting group (3) comprises a series of first riveting organs (9) transversally aligned with respect to an advancement movement of the said conveyor (2), each of which said first riveting organs (9) comprises an upper riveting head (10)

which rests on a superior part of the pallet (1) and inserts at least one rivet (35) into the said superior part of the pallet (1), and a first pushing organ (11) to push the rivet (35) into the said upper riveting head (10), the said first pushing organ (11) being associated with a first activating means.

3. A machine as in claim 2, characterised in that the said first activating means is constituted by a first double-acting jack (13) acting on a first horizontal bar (12) bearing the said first pushing organs (11), the said first horizontal bar (12) being vertically slidable along at least one vertical column (14), along which vertical column (14) a second horizontal bar (15) is slidable, which second horizontal bar (15) bears the said upper riveting heads (10), a connection means being provided between the said first bar (12) and the second bar (15).
4. A machine as in claim 3, characterised in that the said connection means is constituted by a vertical rod (16) fixed superiorly to the said first bar (12) and inferiorly slidably inserted in an extension (18) fixed to the said second bar (15), the said vertical rod (16) being inferiorly equipped with an enlargement (19) which permits, by action on the said extension (18), of raising the said second bar (15) on the action of the said double-acting jack (13), or of sliding inside the said extension (18) and thus permitting the nearing or distancing of the said first bar (12) with respect to the second said bar (15).
5. A machine as in claim 1, characterised in that the said lower riveting group (4) comprises a series of second riveting organs (21) transversally aligned with respect to the advancement direction of the said conveyor (2), each of which second riveting organs (21) comprises a lower riveting head (22) which rests on an inferior part of the pallet (1) and which inserts at least one rivet (35) in the said inferior part of the pallet (1), and a second pushing organ (23) to push the rivet (35) inside the said lower riveting head (22), the said second pushing organ (23) being associated to a second activating means.
6. A machine as in claim 5, characterised in that the said second activating means is constituted by a second double-acting jack (25) acting on a third horizontal bar (24) bearing the said second pushing organ (23), the said third horizontal bar (24) being slidable vertically along at least one vertical column (26), along which a fourth horizontal bar (27) is slidable, which fourth horizontal bar (27) bears the said lower riveting heads (22), and which fourth horizontal bar (27) is activatable

through a leverage (28) by a third double-acting jack (29).

7. A machine as in claim 5, characterised in that the said lower riveting head (22) is constituted by a body (31) exhibiting at a top of the said body (31) mobile jaws (32) and internally a straight vertical through-hole (33), opening at the said mobile jaws (32) to which through-hole (33) is connected an inclined hole (34) internally to which inclined hole (34) the rivets (35) travel singly under the pressure of compressed air, said rivets (35) becoming positioned with a point at an end of a stop rod (36) transversally mobile with respect to the said straight vertical hole (33) and with a rivet head blocked by a shaped element (37) eccentrically hinged and associated to a contrast spring (39), the said spring (39) being compressed during transit of the rivet (35) by action of the rivet head on the said shaped element (37), the said vertical through-hole (33) being able to receive a press-rod (40) mobile along the said straight through-hole (33), associated to the said second pushing organ (23).

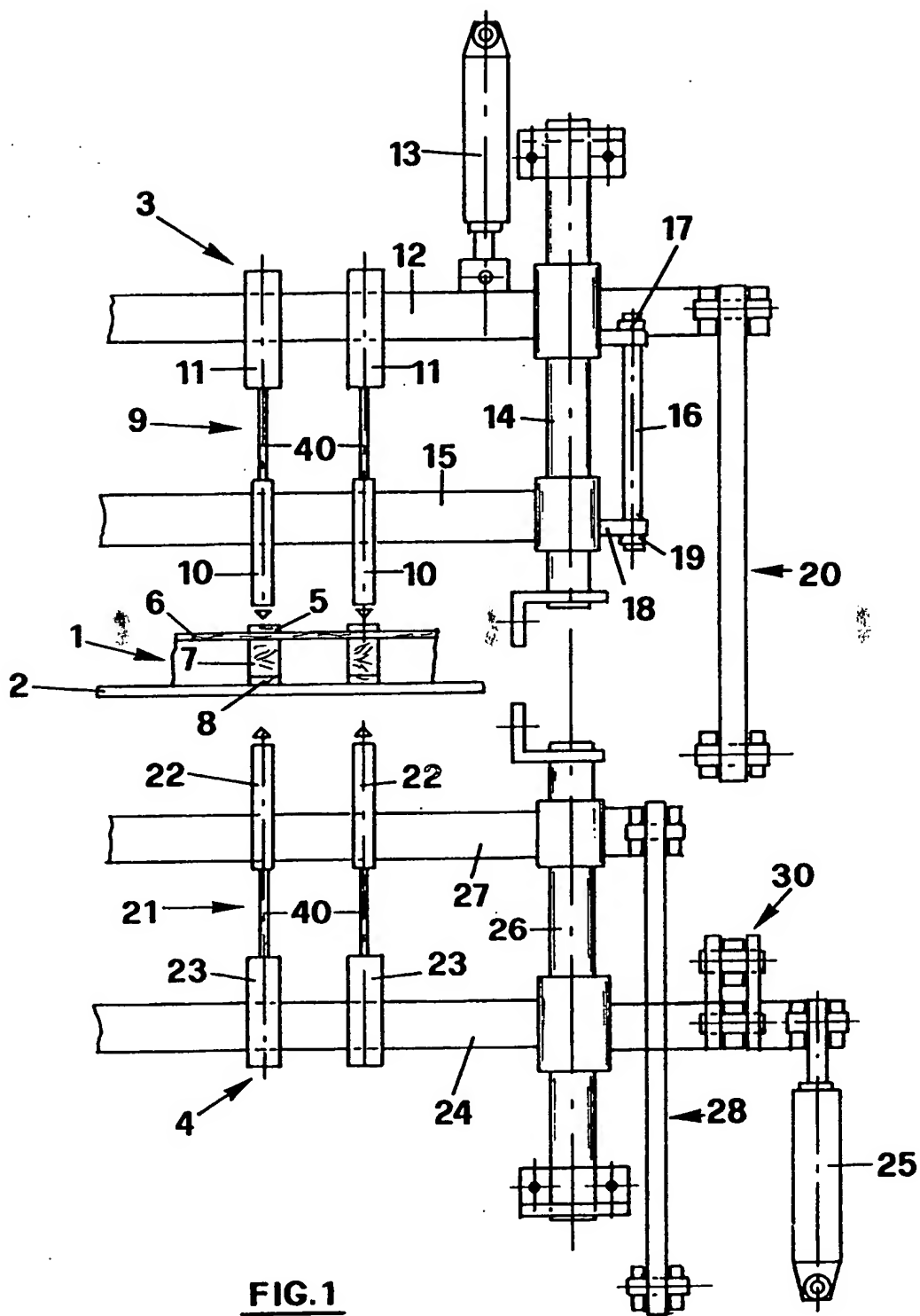
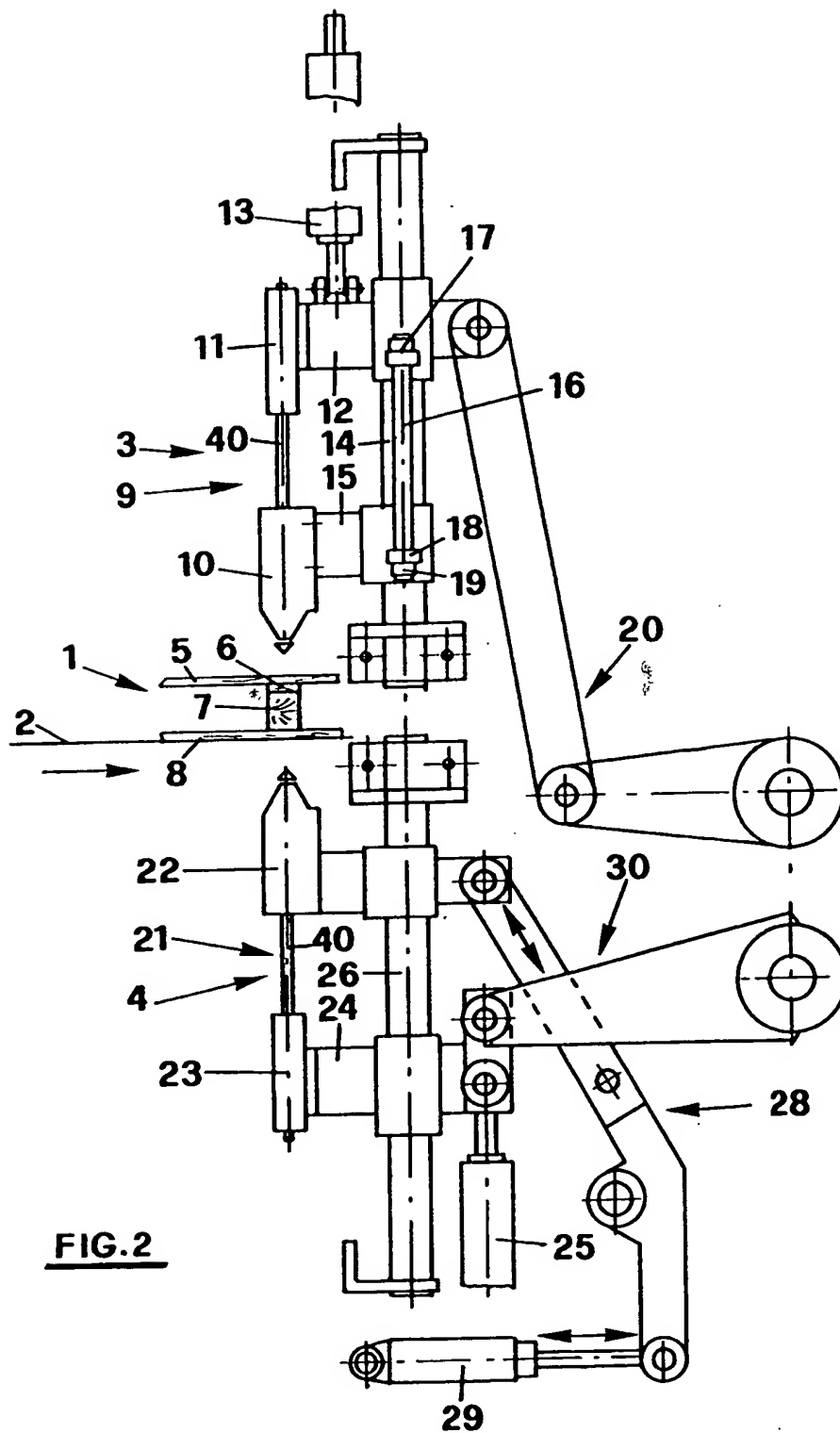


FIG. 1



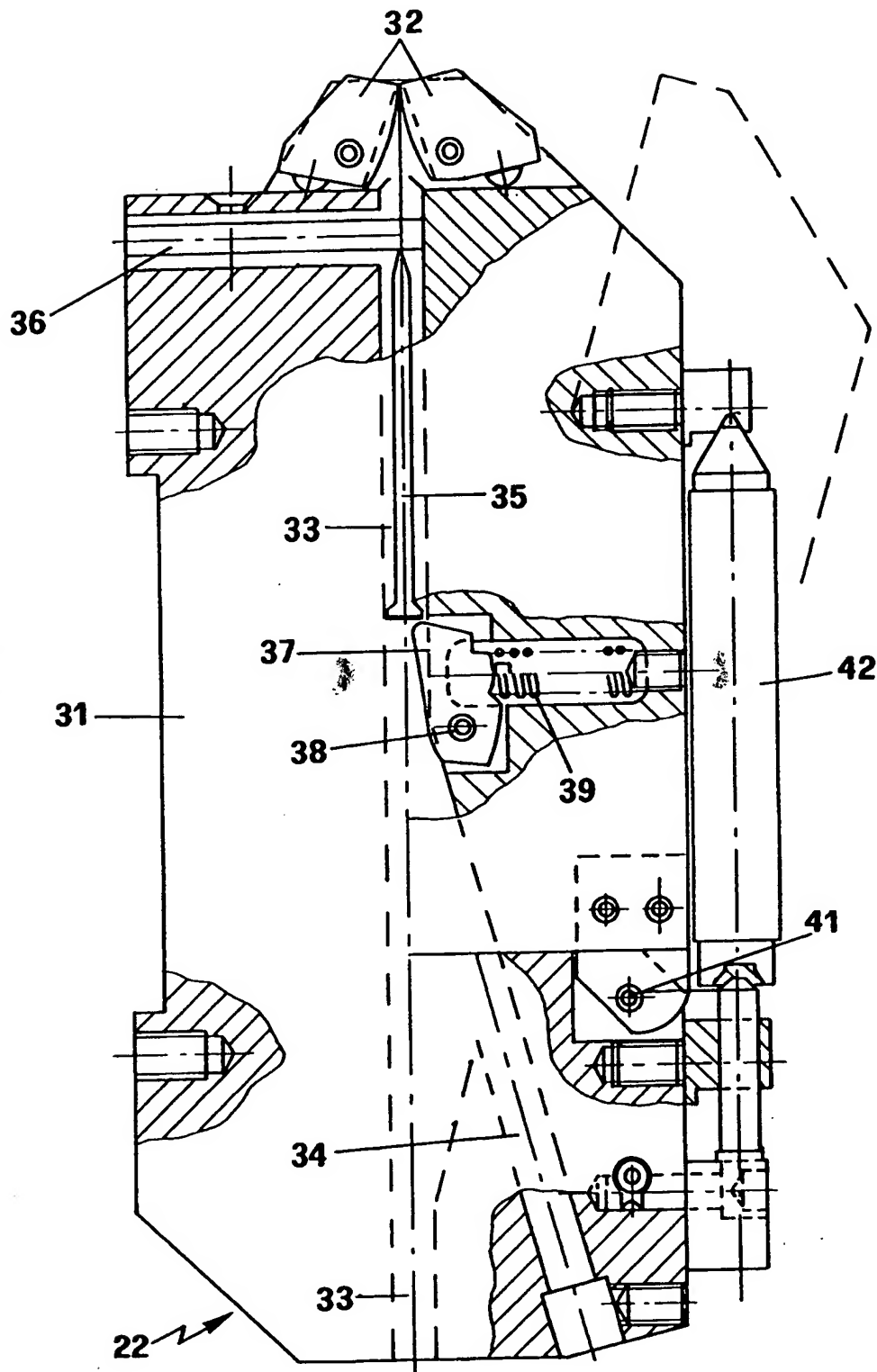


FIG. 3



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# EUROPEAN SEARCH REPORT

Application Number

EP 93 83 0185

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X A	US-A-4 204 624 (GUNN ET AL) * column 1, line 58 - line 60 * * column 3, line 60 - column 4, line 3 * * column 4, line 67 - column 5, line 3 * * column 6, line 23 - column 7, line 55 * * column 9, line 64 - column 10, line 9; figures 1-4,8 * ---	1,2,5 3,6,7	B27F7/00 B27F7/02
X	US-A-4 793 540 (MANGAN ET AL) * column 2, line 38 - line 40 * * column 3, line 45 - line 56 * * column 3, line 63 - line 66; figures 1,2 * ---	1	
A	US-A-5 058 795 (TONUS) * column 1, line 42 - line 45 * * column 1, line 55 - column 2, line 9 * * column 6, line 15 - line 21 * * column 6, line 61 - column 7, line 2; figure 4 * ---	1	
A	US-A-4 444 348 (CAMPBELL, JR.) * column 2, line 40 - line 45; figure 2 * -----	7	TECHNICAL FIELDS SEARCHED (Int. Cl.5)  B27F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 18 AUGUST 1993	Examiner PETERSSON M.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons A : member of the same patent family, corresponding document	

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